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तकनीकी अपेक्षाएँ
(दूसरा पुनरीक्षण)

**Agricultural Tractors — Operator's
Seat — Technical Requirements**
(*Second Revision*)

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FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Agricultural Machinery and Equipment Sectional Committee, had been approved by the Food and Agriculture Division Council.

The use of tractors has taken prominent place in Indian agriculture for mechanizing various agricultural operations. For ensuring efficiency of operations, it would be desirable to improve the comfort and safety of the operators. Standardized dimensions of operator's seat and location of specific controls relative to SIP will assist the future design of operator's seating accommodation on agricultural tractors.

This standard was first published in 1988. The first revision was taken up to incorporate requirements of ISO 4253: 1993 "Agricultural tractors — Operator's seating accommodation — Dimensions". The following major changes were incorporated in the first revision:

- a) All the dimensions have been specified with reference to seat index point (SIP);
- b) Keeping the technological restraints in view minimum longitudinal adjustment of the seat has been modified to 25 in place of 75 corresponding to ISO 4253;
- c) Vertical distance of SIP from footrest and horizontal distance of brake pedals and foot throttle was deviated from ISO 4253 : 1993;
- d) No graphical presentation was adopted for pedal position relative to SIP; and
- e) Functional requirements of seat as given in IS 12343 were retained.

In this revision the following modification have been done on the basis of ergonomic data received from Central Institute of Agricultural Engineering and Mahindra and Mahindra Limited:

- a) The dimension in pedal location of the l_1 and l_2 ranges from 410 mm to 720 mm and 230 mm to 460 mm instead of 355 to 770 mm and 380 mm to 620 mm and the distance of the foot accelerator pedal forward from the transverse axis is not greater than 90 percent of l_1 .
- b) Also, the dimension h_2 is 265 mm to 385 mm instead of 175 mm to 385 mm in Steering — Wheel Location.
- c) Deflection of suspension at mass adjustments for drivers 40 kg to 100 kg in place of 50 kg to 120 kg.
- d) Functional requirements for seat are 40 kg to 100 kg in place of 50 kg to 120 kg.
- e) Operator seating accommodation, plan view, has been modified.

In the preparation of this standard, considerable assistance has been derived from the following standards:

ISO 4253 Agricultural tractors — Operator's seating accommodation — Dimensions

The composition of the Committee, responsible for the formulation of this standard is given at Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AGRICULTURAL TRACTORS — OPERATOR'S SEATING — TECHNICAL REQUIREMENTS

(*Second Revision*)

1 SCOPE

This standard lays down dimensions for the operator's seat and the location of specific controls relative to the Seat Index Point (SIP) within the seating accommodation on agricultural tractors with a track width greater than 1150 mm. The controls included are the steering-wheel, clutch pedal, brake pedal(s), and throttle pedal. This also covers functional requirements of seat and their test method namely, seat suspension, lateral stability and seat vibration.

2 REFERENCES

The Indian Standards given below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated:

<i>IS No.</i>	<i>Title</i>
IS 8133 : 2021	Guidelines for location and operation of operator controls on agricultural tractors and machinery (<i>second revision</i>)
IS 11113 : 1999	Earth-moving machinery — Seat index point (<i>second revision</i>)
IS 13581 : 1993	Agricultural wheeled tractors — Operator's seat — Laboratory measurement of transmitted vibration

3 DEFINITIONS

For the purposes of this standard, the following definitions shall apply.

3.1 Length of Seat — Horizontal distance parallel to the longitudinal plane of the tractor, measured from the front edge of the seat cushion (offset 150 mm on either side of the longitudinal centre line) to the vertical transverse plane containing the seat index point.

3.2 Width of Seat Cushion — Width measured along the transverse plane through the seat index point.

3.3 Pedal(s) — Any or all of the clutch, brake and throttle pedals.

4 ADJUSTMENTS OF PEDALS AND STEERING-WHEEL

4.1 The pedals shall be adjusted in accordance with the manufacturer's instructions. Measurements of the pedal position shall be made before any force is applied to move the pedals.

4.2 The measurement point of a pedal is where the longitudinal and transverse centre lines of the pedal tread surface intersect.

4.3 The measurement point for the steering-wheel is the point where the centre line through the steering-wheel axis intersects with the upper plane of the steering-wheel rim.

5 LATERAL ARRANGEMENTS OF PEDALS

The pedals shall be placed in the following order from the left-hand side to the right-hand side; clutch (operated by the left foot), brake(s) (operated by the right foot) and, if installed, the foot throttle (operated by the right foot).

NOTE — The arrangement is in accordance with the recommendations in IS 8133.

6 DIMENSIONS

The dimensions and angles for the operator's seating accommodation shall be as shown in Figs. 1 and 2. Before measurements are made, the SIP shall be determined, with the seat at the mid-point of the seat's longitudinal, vertical and angular adjustment.

6.1 Seat Dimensions

6.1.1 Seat dimensions shall be in accordance with Figs. 1 and 2. The rearward inclination of the loaded seat cushion surface shall be 3° to 12° to the horizontal, measured with the loading device specified in IS 11113 in position. Choice of angle of inclination within this range will depend on the seating position.

6.1.2 The minimum and preferred ranges of longitudinal and vertical adjustment of the seat from its mid-position are given in Table 1. The longitudinal and vertical adjustments shall be independent of each other. It shall be possible to make such adjustments without the use of tools.

Table 1 Seat Adjustment
(Clause 6.2.2)

Adjustment	Range, mm	
	Minimum	Optimum
(1)	(2)	(3)
Longitudinal adjustment forward and rearward from the mid-position	± 25	± 100
Vertical adjustment upwards and downwards from the mid-position	± 30	± 50

6.2 Pedal Location

The position of the clutch, brake and foot accelerator pedal from the SIP is mainly dependent on the angle between the operator's upper and lower leg. The dimensions l_1 and h_1 (see Fig. 1) shall range from 410 to 720 mm and 230 to 460 mm, respectively. The distance of the foot accelerator pedal forward from the transverse axis through the SIP shall not be greater than 90% of l_1 .

6.3 Steering-Wheel Location

6.3.1 The position of steering-wheel relative to SIP is mainly dependent on the angle of the upper arms to the torso and the angle between the upper and lower arm. The dimensions l_2 and h_2 (see Fig. 1) shall be 425 to 525 mm and 265 to 385 mm, respectively.

6.3.2 The longitudinal axis through the centre of the steering-wheel may be offset a maximum of ± 50 mm from the longitudinal axis through the SIP.

6.4 Steering-Wheel Angle

The choice of steering-wheel angle (see Fig. 1, α) is affected by the seating position, steering-wheel diameter and the force required to turn the steering-wheel. The steering-wheel angle, α shall be in the range 0 to 40°.

6.5 Silencer

The minimum vertical distance of top of silencer from SIP shall be 800 mm.

7 FUNCTIONAL REQUIREMENTS

7.1 Seat Suspension

The suspension system of the seat shall be capable of providing the range of adjustment as a function of the driver's mass of 40 to 100 kg when tested in accordance with the method given in A-2.

7.2 Lateral Stability

The change in the angle of inclination measured according to A-3 shall not exceed 5°.

7.3 Vibration

The amplitude of mechanical vibration when tested in accordance with IS 13581 shall not be more than 100 μm .

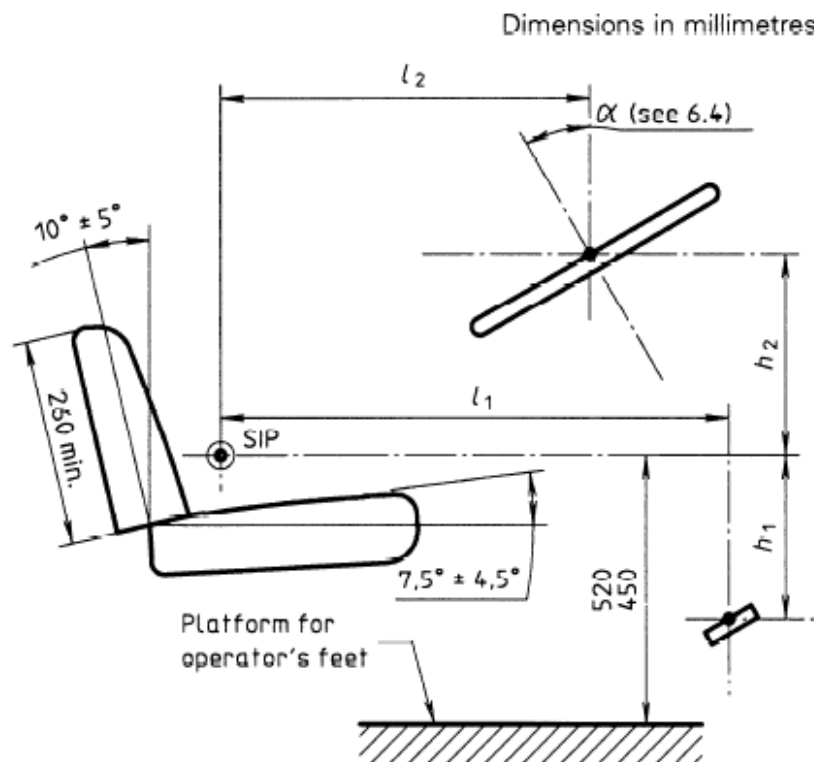


FIG. 1 OPERATOR'S SEATING ACCOMMODATION SIDE VIEW

Dimensions in millimetres

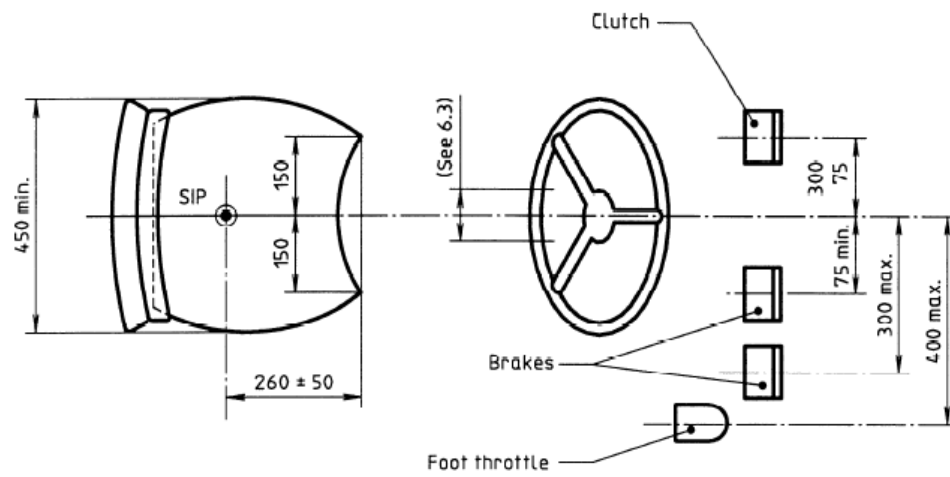


FIG. 2 OPERATOR'S SEATING ACCOMMODATION PLAN VIEW

ANNEX A

(*Clauses 7.1 and 7.2*)

METHOD OF TESTS OF SEAT

A-1 GENERAL**A-1.1 Seat Index Point**

The seat index point (SIP) shall be measured in accordance with IS 11113.

NOTE — The SIP is normally 90 mm above and 140 mm in front of SRP.

A-2 STATIC DEFLECTION TEST

A-2.1 The suspension characteristics are determined by a static test. The range of adjustment to the driver's mass is calculated from the suspension characteristics. These calculations are not necessary in the case of seats that cannot be manually adjusted to the driver's mass.

A-2.2 The seat is mounted on a test stand or on a tractor and a load applied to it, either directly or by means of a special device. This load shall not differ by more than 5 N from the nominal load. The measuring error for the suspension travel shall not exceed of ± 1 mm. The load shall be applied in accordance with the procedure laid down in 5 of IS 11113.

A-2.3 A complete characteristic curve representing the deflection of the suspension system shall be plotted from zero loads to maximum load, and back to zero (see Fig. 3). The load graduations at which the suspension travel is measured shall not exceed 100 N; at least eight measurement points shall be plotted at approximately equal intervals in the suspension travel. The point taken as the maximum load should be either that at which no further suspension travel can be measured, or a load of 1 500 N. After each application or removal of the load, the suspension travel shall be measured 200 mm in front of the seat reference point or 60 mm from SIP in the median longitudinal plane of the seat surface. After application or removal of the load, the seat shall be allowed to return to its at rest position.

A-2.4 In the case of seats with a mass adjustment scale, the characteristic curves representing the deflection of the suspension system are plotted at mass adjustments, for drivers having a mass of 40 kg and 100 kg. In the case of seats without a mass adjustment scale and with

adjustment stops, measurements are taken at the lowest and the highest mass adjustment. In the case of seats without a mass adjustment scale or adjustment stops, the adjustment shall be so selected that:

- a) For the lower mass adjustment limit, the seat just returns to the top of the suspension travel when the load is removed; and
- b) For the upper mass adjustment limit, the load of 1500 N depresses the seat to the lowest limit of the suspension travel.

A-2.5 The mean position of the suspension system is the position which the seat assumes when it is depressed by half the full travel of the suspension system.

A-2.6 Since the characteristic curve of the suspension system are generally hysteresis loops, the load must be determined by drawing a centre line through the loop.

A-2.7 To determine the limits of adjustment range as a function of the driver's mass the vertical forces determined in accordance with **A-2.6** for points A and B (see Fig. 3) shall be multiplied by the scale factor 0.13 kg/N.

A-3 LATERAL STABILITY TEST

A-3.1 The seat shall be set for the upper limit of the weight adjustment and connected to the test stand or to the tractor in such a way that its base plate rests on a rigid plate (test stand) not smaller than the base plate itself.

A-3.2 A test load of 1 000 N is applied to the surface or cushion of the seat. The point of application shall lie 200 mm in front of the seat reference point or 60 mm from SIP and alternately on the two sides 150 mm from the plane of symmetry through the seat.

A-3.3 During the application of load, the variation in the lateral angle of inclination of the seat surface is measured in the end settings for horizontal and vertical seat adjustment. The permanent deformation close to the point of application of the load is not to be taken into consideration.

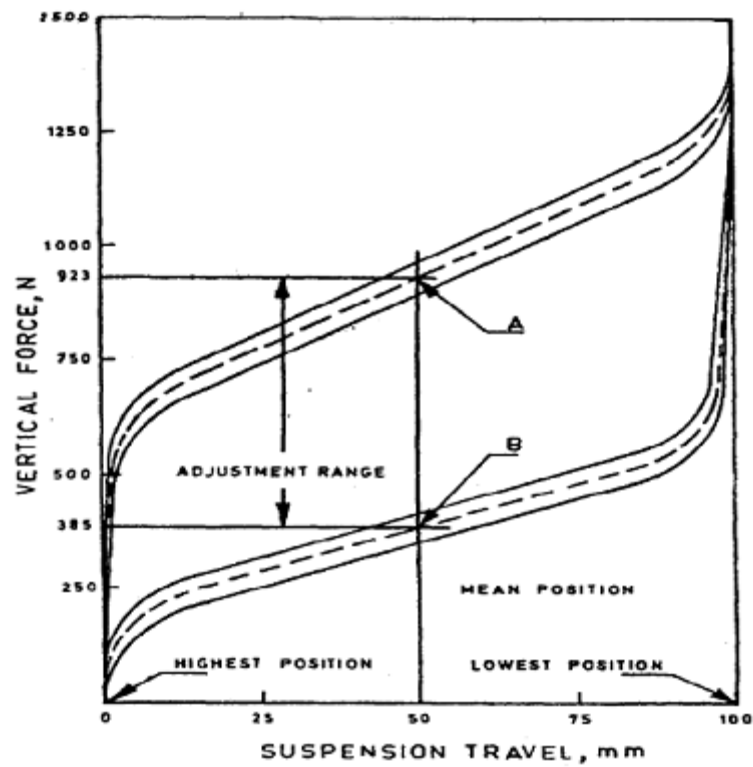


FIG. 3 STATIC DEFLECTION CURVES

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3. Mehta, C.R., Gite, L.P., Pharade, S.C., Majumder, J., Pandey, M.M. (2008). Review of anthropometric considerations for tractor seat design. International Journal of Industrial Ergonomics, 38 (5-6), 546-554.

ANNEX B*(Foreword)***COMMITTEE COMPOSITION**

Agricultural Machinery and Equipment Sectional Committee, FAD 11

<i>Organization</i>	<i>Representative(s)</i>
Indian Council of Agricultural Research, New Delhi	DR K. K. SINGH (Chairman)
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SCIENTIST 'C' FAD, BIS

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Central Farm Machinery Training & Testing Institute, Budni	SHRI J. J. R. NARWARE
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